

CLAIM AMENDMENTS

- 1 1. (currently amended) A method of determining a parameter of interest of an
2 earth formation using a tool conveyed in a borehole in the earth formation, the
3 method comprising:
- 4 (a) obtaining measurements indicative of said parameter of interest with a
5 ~~first resistivity measuring~~ galvanic instrument responsive to a property
6 of the earth formation proximate to the borehole (near zone);
- 7 (b) determining from said measurements a ~~first~~ model comprising a
8 property of said near zone, zone;
- 9 (c) obtaining multicomponent measurements indicative of a vertical
10 resistivity of said earth formation; and
- 11 (d) determining from said ~~first~~ model and said multicomponent
12 measurements said parameter of interest.
- 13
- 1 2. (currently amended) The method of claim 1 wherein said property of said ~~first~~
2 model comprises at least one of (i) a thicknesses of a plurality of layers, (ii) a
3 length of the near zone corresponding to a plurality of layers, and (iii) a
4 resistivity of an invaded the near zone corresponding to said a plurality of
5 layers, and (iii) (iv) horizontal resistivities of said earth formation outside said
6 invaded near zone.
- 7
- 1 3. (original) The method of claim 1 wherein said parameter of interest comprises

2 at least one of (i) a vertical resistivity of said earth formation, and, (ii) an
3 anisotropy factor for said earth formation.

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1 4. **canceled**

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1 5. (currently amended) The method of ~~claim 4~~ claim 1 wherein said galvanic
2 instrument comprises at least one of (i) a Dual Laterolog/Microlaterolog
3 (DLL/MLL), [and,] and (ii) a High-Definition Lateral Log/Microlaterolog
4 (HDLL/MLL).

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1 6. (currently amended) The method of claim 1 wherein determining said first
2 model comprises performing an inversion of measurements made by said first
3 galvanic instrument.

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1 7. (currently amended) The method of claim 1 wherein determining said
2 parameter of interest further comprises performing an inversion of said
3 multicomponent measurements wherein said thicknesses of said layers, ~~and~~
4 ~~said length and resistivity corresponding to each of said plurality of layers are~~
5 fixed in said inversion.

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1 8. (original) The method of claim 7 wherein performing said inversion further
2 comprises defining a global objective function that is the sum of a data

3 objective function and a model objective function.

4

1 9. (original) The method of claim 7 wherein performing said inversion further
2 comprises using a rapid inversion algorithm.

3

1 10. (original) The method of claim 9 wherein said rapid inversion is performed
2 substantially at the well site.

3

1 11. (original) The method of claim 1 wherein said multicomponent measurements
2 comprise measurements made at a plurality of frequencies.

3

1 12. (original) The method of claim 1 wherein said multicomponent measurements
2 comprise measurements made at two frequencies.

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1 13. (currently amended) An apparatus for use in a borehole in an earth formation
2 for determining a parameter of interest of the earth formation, the apparatus
3 comprising:

4 (a) a ~~first~~ galvanic resistivity measuring instrument responsive to a
5 property of the earth formation proximate to the borehole (near zone);

6 (b) a processor ~~for determining~~ which determines from said measurements
7 made by said ~~first~~ galvanic instrument a ~~first~~ model comprising
8 properties of said near zone,

- 9 (c) a second resistivity measuring instrument ~~for obtaining~~ which obtains
10 measurements indicative of a vertical resistivity of said earth
11 formation; and
12 (d) a processor ~~for determining~~ which determines said parameter of
13 interest from said first model and said measurements ~~made~~ made by
14 said second instrument.
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1 14. **canceled**
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1 15. (currently amended) The apparatus of claim ~~14~~ 13 wherein said galvanic
2 instrument comprises at least one of (i) a Dual Laterolog/Microlaterolog
3 (DLL/MLL), [and,] and (ii) a High-Definition Lateral Log/Microlaterolog
4 (HDLL/MLL).
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1 16. (currently amended) The apparatus of claim ~~14~~ 13 wherein said galvanic
2 instrument comprises an array device.
3

1 17. (original) The apparatus of claim ~~14~~ 13 wherein said second instrument
2 comprises an induction device having a plurality of transmitter-receiver
3 combinations, wherein at least one transmitter or at least one receiver
4 comprises an antenna with an axis inclined to an axis of the second
5 instrument.

6

1 18. (currently amended) The apparatus of claim 14 wherein said model further
2 comprises (i) thicknesses of a plurality of layers, (ii) a length and resistivity of
3 an invaded zone corresponding to said plurality of layers, [and,] and (iii) a
4 horizontal resistivity of said earth formation outside said invaded zone.

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1 19. (currently amended) The apparatus of claim 13 wherein said parameter of
2 interest comprises at least one of (i) a vertical resistivity of said earth
3 formation, [and,] and (ii) an anisotropy factor for said earth formation.

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1 20. (currently amended) The apparatus of claim 13 wherein determining said ~~first~~
2 model comprises performing an inversion of measurements made by said ~~first~~
3 galvanic instrument.

4

1 21. (currently amended) The apparatus of claim 13 wherein determining said
2 parameter of interest further comprises performing an inversion of said
3 measurements made by said second instrument wherein said thicknesses of
4 ~~said~~ a plurality of layers, and ~~said~~ a length and a resistivity corresponding to
5 each of said plurality of layers are fixed in said inversion.

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1 22. (original) The apparatus of claim 13 wherein said processor in (d) performs
2 said inversion substantially at the well site.

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1 23. (original) The apparatus of claim 13 wherein at least one of said processor in
2 (b) and said processor in (d) is at a surface location.

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1 24. (original) The apparatus of claim 13 wherein at least one of said processor in
2 (b) and said processor in (d) is at a downhole location.

3

1 25. (currently amended) A system for estimating a parameter of interest of an
2 earth formation penetrated by a borehole, the system comprising:
3 (a) a ~~first~~ galvanic resistivity measuring instrument responsive to a
4 property of the earth formation proximate to the borehole (near zone);
5 (b) a processor ~~for determining~~ which determines from said measurements
6 made by said ~~first~~ galvanic instrument a ~~first~~ model comprising
7 properties of said near zone,
8 (c) a second resistivity measuring instrument ~~for obtaining~~ which obtains
9 measurements indicative of a vertical resistivity of said earth
10 formation;
11 (d) a processor ~~for determining~~ which determines said parameter of
12 interest from said ~~first~~ model and said measurements ~~and~~ made by
13 said second instrument; and
14 (e) a conveyance device ~~for conveying~~ which conveys said ~~first~~ galvanic
15 and second instruments into said borehole.

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1 26. (original) The system of claim 25 wherein said conveyance device comprises a
2 wireline.

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1 27. (original) The system of claim 25 wherein said conveyance device comprises
2 coiled tubing.

3

1 28. (original) The system of claim 25 wherein said conveyance device comprises a
2 drilling tubular.

3

1 29. (currently amended) The system of claim 25 wherein said second instrument
2 comprises an induction device having a plurality of transmitter-receiver
3 combinations, wherein at least ~~on~~ one transmitter or at least one receiver
4 comprises an antenna with an axis inclined to an axis of the second
5 instrument.

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1 30. canceled

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